

Week 10: Meiosis

BIOL 101: General Biology I

LEARNING OBJECTIVES

- ☐ Explain how haploid and diploid cells differ; know which cells in the human body are diploid vs. haploid.
- ☐ Recognize the phases of meiosis from diagrams
- ☐ Describe the process of synapsis during prophase I and explain how genetic recombination occurs.
- ☐ Explain how independent assortment, crossing over, and random fertilization contribute to genetic variation in sexually reproducing organisms.
- ☐ Explain why heritable variation is crucial to the theory of evolution

INTRODUCTION

Cell division in eukaryotes is observed in everyday life (cell repair, replacement, and growth) in a process known as mitosis, and in the production of gametes for the next generation in a process known as meiosis. Today we will focus on meiosis. We will work together to understand the terminology and processes associated with your gamete cells and how they are able to produce cells viable for fertilization and reproduction.

ACTIVITY, DATA COLLECTION & ANALYSIS

Meiosis in Eukaryotic Cells

1. Why do eukaryotic cells divide by mitosis AND meiosis?
2. What are the key differences between mitosis and meiosis? (don't think stages here – but rather unique products)
3. Do you remember the difference between homologous chromosomes and sister chromatids?
4. Why do you think variability in gamete cells is critical to evolution of a population?

Meiosis – Hands on!

Working with a partner, find your cell division activity bag provided by your instructor. In the bag, you will find the following: 12 pipe cleaners (2 of each – orange, black, long white, red and white striped, short white, and green); 16 shaped beads (4 of each in different colors – flowers, hearts, stars, animal); 12 round beads (magnetic) attached to your pipe cleaners – **DO NOT REMOVE**, 4 yarn loops, 2 elastic pieces with plastic bead attached, meiosis stage name tags.

Pipe cleaners = chromosomes (homologous chromosome pairs = orange + black, long white + red and white striped, short white + green); shaped beads = alleles; round beads = centromeres; yarn = nuclear envelope; elastic bands = centrosomes with spindle fibers

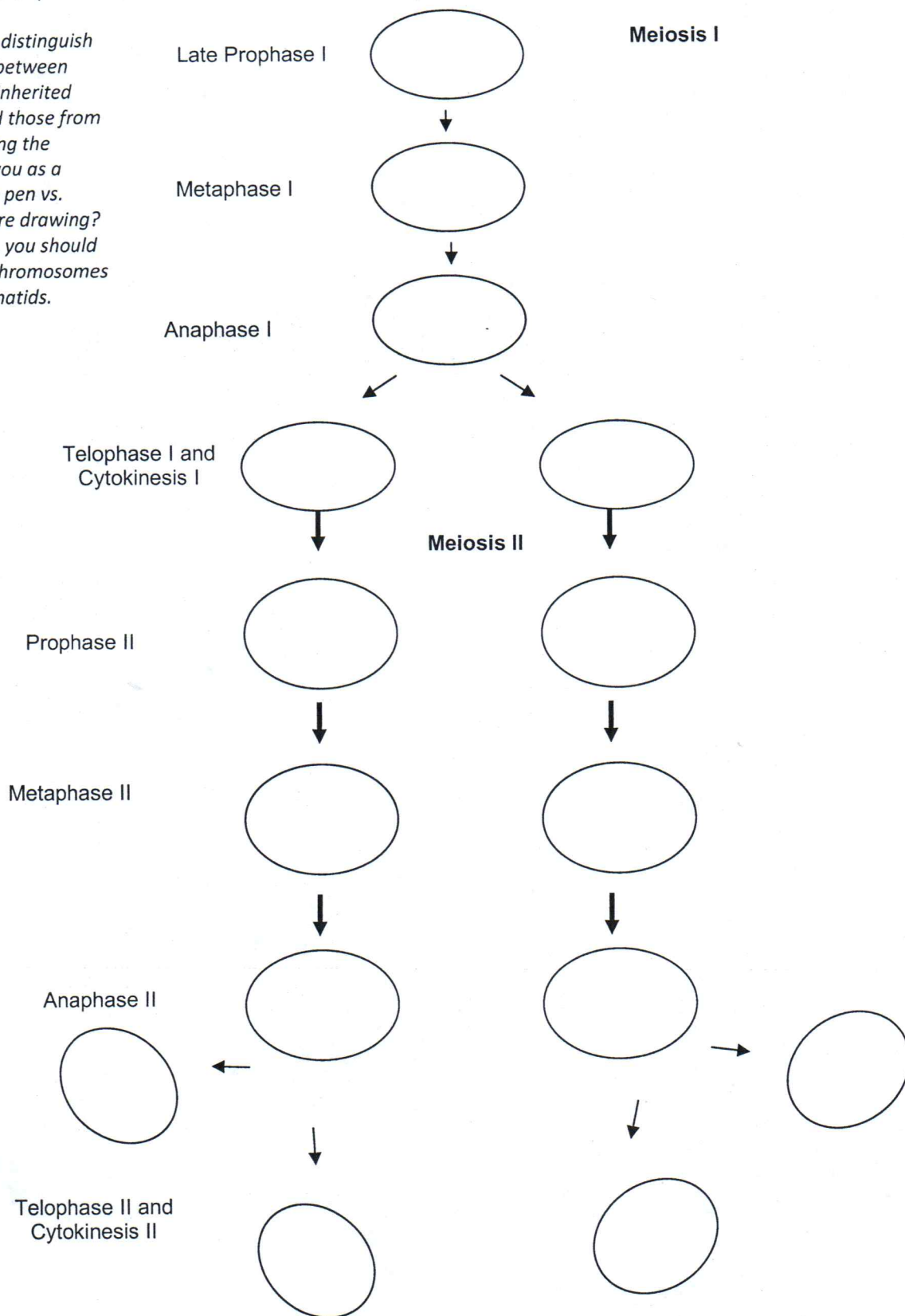
For this activity, you will follow along with your instructor through the stages of meiosis – please do not work ahead!
We recommend working through meiosis on your desk top and add notes / other important information to your white board.

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At each stage, **STOP!!** and take a picture of your setup along with what you have written on your white board! Complete the table below with your observations from our hands on activity.

Make sure you distinguish the difference between chromosomes inherited via the egg and those from the sperm during the production of you as a zygote! Maybe pen vs. pencil as you are drawing? For each circle, you should Note the # of chromosomes vs. sister chromatids.



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STOP HERE! Your instructor is going to demo all of these variations, and for clarity of each type, *please wait!*

Genetic variation caused by meiosis:

5. When and how does recombination occur in gametes?

6. What is the primary result of recombination (crossing over) in gametes?

7. If homologous chromosomes do not separate correctly in Anaphase I of Meiosis I, what is the result? Is this positive or negative, or both?

8. If sister chromatids do not separate correctly in Anaphase II of Meiosis II, what is the result? Is this positive or negative, or both?

9. Think back through all of our discussions of cell division – mitosis and meiosis. What happens if any one of these processes is changed? Faster replication? Slower replication? No replication? How will these changes impact the individual and/or its offspring?